A. M. D. G.

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PHOTOGRAPHIC NOTES. II.

The furnishing of the darkroom (chemicals and apparatus) has already been described. Let us now look at the exposure room. Many professionals exclude daylight, using only steady artificial sources, and thereby eliminating one variable in negative making. For our general work, including photo reproduction of natural objects, daylight with the sky as a reflector (even through windows) is preferable to smaller sources of light; for daylight shadows, so necessary to good relief, are more natural.

The exposure room should be long enough to allow the reduction of a three foot map to slide dimensions i.e. to a three inch negative. The fittings of the room are a stand, camera and lenses, a generous focussing cloth, a focussing glass, and several sheets of white cardboard to serve as reflectors.

The stand, with camera guides on a horizontal bed, should carry an exposure board moveable in a plane vertically and horizontally at right angles with the guides, stand and board being painted deep black. The board (30" x 24") should have fittings to support the objects to be photographed as well as the proper backgrounds. Good jewels are frequently spoiled by a bad setting and a poorly selected background will sometimes kill an otherwise effective slide. These backgrounds are large sheets of paper, white, black, and several shades of grey, all dull-surfaced, not glossy. For some objects the best backgrounds would be black velvet or a piece of black cloth without a pronounced pattern. Shelves for small objects, insects, etc., may easily be made by properly folding the correct background paper (or cloth) so as to have the front-drop, shelf and background in one continuous piece. The movement of the exposure board with its burden should be controlled from the back of the camera.

The camera, not smaller than 5 x 7, with its ground glass and front board both parallel to the exposure board, should have a bellows-draw equal to at least twice the focal length of the lens employed, otherwise it will be impossible without inconvenient appliances to make a negative the same size as the object. The camera may be fitted with swing-backs rarely needed in the exposure room; but in every case if either the horizontal or vertical swing-back be used it should be re-set as soon as possible at the neutral point. The ground glass should be velvet grained, gound side in, of course, (with rare exceptions), and bisected both ways on the ground side by two perpendicular indian-ink lines and then marked off in three, four, and five inch squares concentric with the intersection of the perpendiculars.

A focussing glass (3x at least) should be employed, no matter how good the eyesight of the operator may be. The focussing cloth ought to be light proof and large enough to cover completely the fully extended camera bellows (which may leak) as well as the ground glass. Two lenses, long and short focus, both rectilinear andnot necessarily fast, will make a good optical equipment, though very good results may be had by using only one lens of medium focus for all classes of work. The shorter focus lenses will give better definition with natural objects whose parts are in planes at appreciably different distances from the lens, e.g. the skeleton of a snake's head, a cluster of flowers, etc.

The use of the tools is more important than their perfection. Professor Newcomb once said that the great Bessel could do more with a cart wheel and a spy glass than many modern astronomers with exquisite instruments. In photographing natural objects, in relief, for screen work the most agreeable results are obtained by having a slightly one-sided lighting, but for flat work the objects should be uniformly illuminated. Proper use of the cardboard reflectors will help to balance the lighting.

A few words now about the plates or films. The plates we are going to suggest for both negatives and positives (slides, not paper), may not be the best, but they are certainly the plates with which one may obtain very good results, and after getting first class negatives and positives with these, one may wander into experimental fields. We shall take up now only the prdinary plates, treating of films and chromatic plates later on; though we may state here that a black and white reproduction nearly proportional to the color values of any natural object may be had by using a good fast plate and some legitimate "doctoring" of the negative. For outside biological (or scenic) work have a stock of Seed 30 or Eastman 40 plates, both having nearly the same speed. For inside work (exposure room), diagrams, maps, text and all purely black and white objects (including half tone prints) use the Hammer Slow plate. Some dealers will tell you that the Eastman 33 gives the same results, but try the Hammer Slow and you will not care to change.

For prints, black and white, with continuous shading (not dots) in fair contrast and even in color, use Seed 26; if the prints are flat or very "soft" i.e. lacking in contrast, use the Hammer Slow.

For natural objects, such as minerals, plants, or small animals, use Seed 26; if the animals are living and lively, one may have to use Seed 30 or Eastman 40 with a shutter and direct sunlight. All other exposures are made in diffused light; such lighting with careful time exposures usually produces better negatives.

To give directions for the proper timing of exposures is not practicable without a knowledge of all the conditions. In genreal, with a good morning light, a line diagram of fair size, for example 12" square, on flat white paper brought down to slide dimensions, with lens aperture of f64, would require 8 or 10 seconds exposure with Hammer Slow plate. With the same lens opening and the same lighting, a natural object such as a group of green leaves against a black background, might require 15 seconds with a Seed 26 (a much faster plate than the Hammer Slow). As a rule when the background is dark a slight over exposure will do very little harm. To sum up:-

Black and white, lines or dots: Hammer Slow.
Continuous shading (e.g. photographs), strong: Seed 26.
flat: Hammer Slow.
Natural objects, in exposure room: Seed 26.
outside of exposure room: Seed 30 or Eastman 40.

Cut films of all plate sizes and varying speeds may be bought at the Eastman Stores. If these are used carefully and with the necessary appliances they will give excellent results, but the ordinary Amateur will be better satisfied with plates until his experience widens. The cut films are coated with gelatin on the back to prevent curling; this coating especially when wet is very easily stained and scratched. Plates may be handled in developing, fixing and washing, more quickly and more roughly without injury.

Father J.A. Brosnan S.J.

SIMPLE EXPERIMENTS WITH A RADIOTRON TUBE. (cont. from Vol. II, p 62.)

In the laboratory the variations of the plate current with different plate voltages and different filament temperatures may be studied in detail with the arrangement just described. (Cf. Fig. I.) In the first case the plate voltage is increased by regular steps until the saturation current is reached. Plate voltages are then plotted as abscissae and plate currents as ordinates. This is done for different values of the filament current. In the second case successive filament currents and the corresponding plate currents are measured from a given plate voltage and then plotted.

Experiment VI. To show the effect of a positive potential on the grid. The grid or flattened spiral of fine wire inserted between the filament is due to Dr. Lee DeForest. The remarkeable properties and most of the applications of the radiotron tube are due in great measure to this simple addition. As Van der Bijl says, it has given us "a device of tremendous potentialities -- one that can justly be placed in the same category with such fundamental devices as the steam engine, the dynamo and the telephone." It is well therefore, to explain clearly and illustrate experimentally the action of the grid. Its special function is to modify or control the plate current. By giving the grid a positive or negative potential, it is possible to vary the plate current through wide limits without changing either the plate voltage or filament current. Moreover, -- and this is of the greatest importance --, a minute amount of energy expended on the grid can produce considerable energy changes in the plate current. This action of the grid is due to the effect it exerts upon the negative space charge. When it is negative, it increases equivalently the space charge, thus diminishing the plate current. When it is positive, it lessens the effect of the space charge, thus increasing the plate current.

Acircuit is arranged as in Fig.II. It is like that of Fig. I with the addition of a second voltage divider and voltmeter. The filament F and the plate P are connected with their respective batteries as before. One or two dry cells C are connected across the terminals of a high resistance sliding contact rheostat R3 similar to R2. The positive end of this rheostat is connected to the grid and the sliding contact S is connected to the negative terminal of the filament. Avoltmeter VM2 connected in the usual way serves to measure the potential applied to the grid. With a given filament current the plate current is given a value below its saturation point by proper adjustment of the plate voltage. By means of the slider a fraction of a volt is put upon the grid. The latter now has a positive potential and there will be an immediate increase in the galvanometer deflection. If the grid voltage is increased this deflection also increases.

Experiment VII. To show the effect of a negative potential on the grid. The connections of battery C in Fig. II are reversed

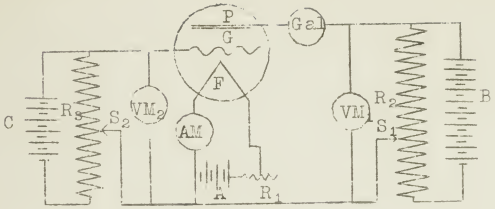

Fig. II.

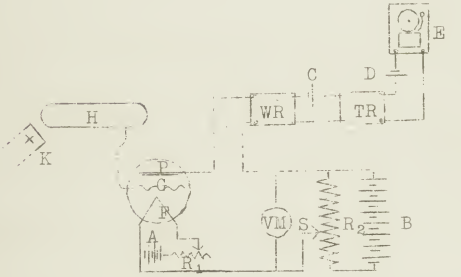

Fig. III.

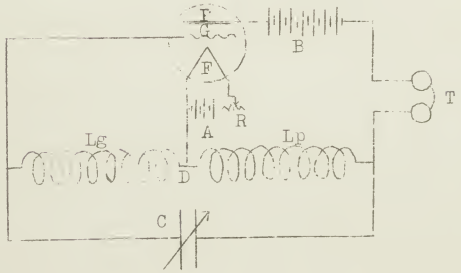

Fig. IV.

making the grid negative. There will be a decrease in the galvanometer deflection. By increasing the negative potential the plate current can readily be reduced to zero.

The action of the grid can be best studied in the laboratory by obtaining characteristic curves similar to those already described for the two electrode tube. The filament current and plate voltage are kept constant and the plate current is measured by means of a milliammeter for different values of the grid voltage. The latter are then plotted as absci sae and the former as ordinates. Similar data are obtained for different plate voltages. These curves show clearly, that a small change in the grid voltage produces a considerable change in the plate current, provided the latter is not near its saturation point. A considerably larger change in the plate voltage would be required to produce the same effect. In other words the grid gives the tube an amplifying power which is one of its most important and variable properties. It may be pointed out that the amplification factor or coefficient of the tube is the ratio of the changes of the plate and grid potentials producing the same change in the plate current. Thus for a certain UV 201 Radiotron when the plate voltage was 40, a change of 0.5 volts on the grid produced the same change in the plate current as a change of 4.5 volts on the plate. Under these conditions the amplification factor of the tube was equal to nine. As a matter of fact, its value varies somewhat with the plate and grid potentials.

The student will observe that although the space between the filament and the plate is a very high vacuum we may, by referring to Ohm's law, speak of its resistance or, to use the more common term, its internal plate resistance, since a given electromotive causes a definite current to flow across it. In the case of a metallic conductor, the resistance, neglecting temperature effects, remains constant, and if the impressed voltages are plotted as abscissae and the corresponding currents as ordinates, the reciprocal of the straight line obtained will be equal to the resistance. If we plot the same data for a vacuum tube a curve and not a straight line is obtained, as has already been pointed out. The slope varies showing that the resistance does not remain constant. However the reciprocal of the slope at any point is equal to the corresponding resistance. Using the UV 201 Radiotron just mentioned with no voltage on the grid, a change of 5 volts on the plate caused a change of 0.0000387 amperes in the plate current. The corresponding internal plate resistance was therefore equal to 12900 Ohms. When the grid is used it can be shown that the resistance is equal to the reciprocal of the slope of the grid voltage-plate current curve multiplied by the amplification factor.

As is well known, when the effect produced upon the plate current by a given potential on the grid is not sufficient for the purpose intended, one or more additional tubes or amplifiers may be employed. Such combinations are of great importance in radio transmission and reception and in various scientific investigations. By means of amplifiers minute amounts of energy may be made to produce very considerable effects, as, for example in operating loud speakers or relays controlling various devices. Striking experiments have been devised to show this action of the tube. Thus in this BULLETIN, Vol. I, No. 3, page 1, (Jan.-Feb., 1924), reference was made to a lecture of Dr. W.R. Whitney, the Director of the Research Laboratory of the General Electric Company, at the Cincinnati Meeting of the American Association for the Advancement of Science in December 1923. The title of the lecture was "The Vacuum-there's something in it", and among other things Dr. Whitney showed, how using amplifiers, a static charge and the output of a photoelectric cell could control a lamp circuit. In this pa-

per we are limiting ourselves to a single tube. An interesting experiment similar to the one just mentioned may be performed with a single tube using a delicate relay.

Experiment VIII. To illustrate the amplifying power of the tube. A Weston Relay (Model 30) or similar instrument and an ordinary telegraph relay are needed. The electric Bean Graer Products Co., of Ithaca, Michigan, advertises a micro-amp. relay which it is claimed is exceedingly delicate. We have not seen one. It would doubtless also serve the purpose. The Weston relay is likewise a very sensitive instrument whose moving coil has a contact arm which opens or closes an external circuit.

The circuit is arranged as in Fig. III. The filament of the tube is connected with the battery A and rheostat as in Fig. I. Two 45 volt B batteries are connected in series to the voltage divider R_2. The voltage applied to the place may be measured if desired by means of the voltmeter VM. The Weston relay WR is put in place of the galvanometer in the plate circuit and is connected with the telegraph relay TR in series with one or two dry cells C. This second relay is connected in series with an electric bell and a couple of dry cells D. The grid G is connected by means of a wire with an insulated brass conductor H such as is used in electrostatics. With the normal filament current the plate voltage is regulated so that the plate current is not quite able to operate the Weston relay. A glass rod is then rubbed with silk and brought near the insulated conductor H. A negative charge will be induced on the nearer side of the conductor and a positive charge on the farther side. The latter is communicated to the grid and neutralizes the negative space charge sufficiently to enable the plate current to operate the Weston relay. The latter then operates the telegraph relay which in turn closes the bell circuit. Instead of the bell, the Mazda lamp or small motor may be used. The lamp may thus be lighted or the motor started by means of the electrified glass rod. The glass rod will actuate the relay even when it is several feet from the conductor. The discharge of the plate of an electrophorous will also operate the relay when it is some distance away.

Experiment IX. To produce undamped oscillations of audio frequency with a Radiotron. A circuit containing inductance and capacitance is necessary. It has a natural period of oscillation whose frequency is given by the equation $n = 1/2\pi\sqrt{LC}$, where L is inductance in henrys and C the capacitance in farads. By properly choosing the constants oscillations from a half cycle a second to a number of million per second are possible. The circuit may be arranged as in Fig. IV though other combinations are possible. The filament of tube is connected as before with battery A and rheostat R. Two inductance coils are connected together with their planes parallel. An inductance of about 125 millihenrys serves very well. The common terminal D is connected to the negative terminal of the filament. A variable condenser C is connected in parallel across their free free terminals. This should have a capacitance of from 0.01 to 1 microfarads. The General Radio Company of Cambridge, Mass. sells a convenient decade condenser with two dials giving a range from 0.01 to 1.1 microfarads adjustable in steps 0.01 microfarad. The accuracy is about 2 per cent and the catalogue price is $50.00. The Leeds and Northrup Company of Philadelphia has recently put a new three dial mica condenser on the market having a total capacitance of 1 microfarad adjustable in steps of 0.001 microfarad. Its price is $175.00. This seems to be a high grade instrument useful for different purposes in the laboratory. Either of these condensers will serve very well for this experiment.

The free end of the coil Lg is connected with the grid and the free terminal of the coil Lp is connected through a loud speaker and a 45 volt battery B with the plate P of the tube. It may be desirable to put a condenser across the terminals of the loud speaker. This can be determined by trial. If an oscillation is started, for example by closing a key in the plate circuit, or even by closing the filament circuit, the grid will have an alternating potential impressed on it by means of the coil coupled with it. This alternating potential will cause a pulsating current in the plate circuit. When constants of the circuit are properly chosen this current will have the same period as the natural frequency of the circuit and by supplying energy losses will keep up undamped oscillations. By making L and C sufficiently large these can be given a frequency capable of affecting the ear. The loud speaker will then emit a musical note whose pitch can be varied by changing either L or C.

Father H.M. Brock S.J.

THE ATOMIC THEORY --- IS IT OBSOLETE?

Much work has been done in recent years, and most important discoveries have resulted, regarding the "building stones" of matter. There is, of course, a very large amount of speculation connected with the entire question, but this much seems to be certain, that the atom is by no means a continuum, but is itself composed of particles which are at relatively enormous distances from one another. In view of these facts, one is very apt to draw the conclusion that there is no such thing as an atom. In fact, the statement is even made that no one believes in the atomic theory any longer; or that the electron theory has completely supplanted the atomic theory; etc., etc. It may not be out of place, therefore, to suggest a few more or less connected ideas which may help to clarify the evident confusion existing in the minds of some regarding this question.

At the very outset a clear distinction should be made between the atomic theory, or rather hypothesis, of the chemist, and the philosophical theory of atomism. The former was proposed to give a reasonable explanation of the observed facts of chemical combinations. The four laws: 1) the persistence of weight, 2) the law of constant composition, 3) the law of multiple proportions, and 4) the law of reciprocal proportions, summarize these facts, especially that the elements combine with one another either in amounts which correspond with their combining weights (law of constant composition, or definite proportions), or with multiples of their combining weights (law of multiple proportions). These facts exist entirely independently of any hypothesis we might propose to explain them.

Such might well be called the essence of the chemist's atomic theory. The characteristic of the philosophical theory of atomism, on the other hand, as far as it concern us here, is perhaps best expressed by the statement that the atom is the ultimate constituent of matter.

It is true that the two theories have as a matter of fact been treated frequently as one, due no doubt to the inborn tendency of every man to philosophize -- to seek ever a deeper and more fundamental explanation of facts. But it must be born well in mind that the chemist as such stops when he gets his rational explanation as postulated by his facts. He may, if he chooses, go further, but he is then acting the philosopher. De facto, the whole history of the development of the atomic theory is crowded with such instances of theorizing.

It is not our purpose here to present the evidence for the actual existence of atoms -- a very broad question in itself. Rather

we are concerned with the relation between the atomic and electron theories. According to the latter the atom is a very complex structure, composed of a number of separate particles. These particles, as is generally conceded, move about a central nucleus in regular orbits -- a sort of miniature solar system. As to the facts, it is quite certain that electrons do exist and that their masses have been determined. Their motions or collocations or positions, etc., within the atom, are the subject of deep speculation.

To the question, therefore, has the electron theory rendered the atomic theory untenable, the answer must be evident to everyone. If you are considering the question merely from the view point of the ultimate constituent of matter, then there is no doubt but that the electron is far more ultimate than the atom. But in that case you are not talking about a theory of the natural sciences. If, however, you mean the chemical hypothesis, then not only has the electron theory not supplanted it but has even assumed it to be true. The very kernel of the electron theory is the discussion of electrons as constituents of atoms, and surely it would be rather incongruous to speak of the constituents of something which does not exist. Hence, the reality of atoms is taken for granted. In fact, were it not so, the entire electron theory would be without meaning.

Granted, therefore, that the atom has been shown to be a very complicated structure, it still remains the unit for the chemist in his operations and changes. In all his calculations, equations, experimentation, etc., he constantly makes use of atoms. Without them he would be absolutely helpless. True, electrons may play a far more important part in these changes than we now dream of, but, as far as we know, they are essentially parts of atoms, even though it is possible to separate them for a time from the whole. Hence, with or without electrons the atom is still the unit of matter during a chemical change.

George J. Shiple S.J.

THE SEVENTY-EIGHTH ANNUAL MEETING OF THE PONTIFICAL ACADEMY OF SCIENCE "NUOVI LINCEI".

It might be of interest to the readers of the Bulletin to learn something of the last annual meeting of the Pontifical Academy of Science, called the "Nuovi Lincei". This academy, whose President is Father Gianfranceschi S.J., is made up of prominent Catholic scientists all over the world, some as active members and others as corresponding members. Among the latter is Dr. Alexis Carrel, of the Rockefeller Institute, New York, who presented to the last meeting some photographs of the embryonic chick heart which he has been growing in vitro for thirteen years.

The meeting was held in the Vatican on the 28th of June, 1925. The Presidential Address of Father Gianfranceschi was on the latest experiments of Milliken, Gale and Miller on the theory of relativity. Father Gianfranceschi was reappointed President of the Academy by the Holy Father.

Father Hagen S.J. presented three articles published by Dr. Becker in "Astronomische Nachrichten" on cosmic clouds, and a note of his own concerning the problem of the variable stars of the type Cephei.

The academician Laas read a paper entitled: "The Conservation of Specific Characters", in which he described some facts observed by him illustrating the various processes by which conformity to type is brought about in different species. The paper was later discussed by the academicians Giorgi, Teofilato, Anile, Zanon, Caronia and Lepri.

Dr. Caronia spoke on his experiments in the prophylactic treatment of measles. He said he had great success so far, only two per cent of those vaccinated failing to react favorably, so that complete immunization against this disease seems to be not far off.

The corresponding member, Mr. Scatizzi presented a paper on mathematics, and Mr. Giorgi, a note on variable movements and the ether. Mr. Neviani read a paper on the great Catholic geologist, Stanislaus Meunier, and showed that with all his immense labors which are collected in 580 works, he remained always a firm believer.

Mr. Tulli spoke on the Amundsen expedition and what it had contributed to Polar Geography.

Finally Father Gianfranceschi showed the assembly Father Wulf's (Valkenburg) apparatus for observing the trajectory of particles according to the method of C.T.R. Wilson.

In secret session Professor Ricci-Curbastra was named a corresponding member, and it was decided to exchange publications with other scientific societies.

"LA CATALISIS QUIMICA" by Rev. Edward Vitoria S.J., D.Sc., Director of the Instituto Quimico of Sarria (Barcelona), Spain. Third edition, 636 pages, 22 figures. Miguel Casals, Caspe, 108, Barcelona, 1925.

The publication of the third edition of the well known work of Father Vitoria attests the popularity which it has in the schools of Spain and Spanish America. However, this is not a mere reprint of former editions, since it is enlarged by about one hundred pages and contains five hundred additional references to some two hundred different authors. This brings the work up to date and makes it continue to be, what it has always been an authoritative text and a valuable work of reference. It is also a testimony to the untiring labors of Father Vitoria, who in spite of his years, continues his lectures and direction of the Chemical Institute.

FATHER SAZ AND THE "PROTECTIONIST FLY".

Under this humorous caption Father Eugene Saz, of the Chemical Institute of Sarria, has an article in IBERICA, for Oct. 17, a summary of which might be of interest to the readers of the BULLETIN. One will recall how some two years ago the Department of Commerce of the United States Government, at the instance of the Department of Agriculture of the same, put an embargo on Spanish grapes. That this should produce no small 'stir' in Spain is evident when it is known that in the years before prohibition, at least, the United States imported 400,000 barrels of Spanish grapes worth some 8,000,000 pesetas. Worst of all, Cuba, Brasil and Santo Domingo followed the example set by their sister republic of the North. At first the measure was attacked by the Spanish papers as a purely protectionist scheme for the benefit of the California grape growers, and the very existence of the pest which was the alleged reason for the embargo was denied. Hence the name 'Protectionist Fly'.

Father Saz, however, who as far back as 1917 had called the attention of the scientists to the pest in question, gives the readers of IBERICA the facts in the case and draws some interesting conclusions. In the first place, the pest really exists. It is a kind of gangrene on the grapes, caused by the larva of a fly known as Ceratitis capitata Wied., or among the people, as the "fruit fly" or the "Mediterranean fly". It is thought to have come originally from Equatorial Africa and was first observed in Spain in the year 1842. Since then it has spread over the whole Mediterranean basin, to the Azores, the eastern coast of South America, Australia and Hawaii. In the second place, this

fly really causes damage to the grape crop. Thirdly, the attention of the Spanish grape growers was called to it many years ago by Silvestri, the world's greatest authority on Ceratitis, at a time when it might have been eradicated, but due to their listlessness nothing was done.

From this it would seem that the American embargo on Spanish grapes was justified, since our country is yet still happily free from this pest. Father Saz, however, does not admit this as a legitimate conclusion from the facts, as further explained by him. From experiments made by him he has come to the conclusion that 1) the grape is not the proper medium for the growth of Ceratitis, but rather the orange, fig and a few other fruits, and that it is only when there is not enough of the latter to go around that it infests the grape. 2) This occurs only rarely and is due to a mild winter when Ceratitis is not at all diminished by the cold weather, for it succumbs easily to a very slight cold. 3) Hence, since the grape is not mature till October, if shipped to the northern parts of the United States, all the larvae would be killed by the comparatively low temperature prevalent in those regions at that time of the year. 4) Finally, since the presenceof the larvae is macroscopically evident even before picking, all infested grapes could be rejected, and the rest, if necessary, could be subjected to refrigeration for a short time which would completely sterilize them from Ceratitis.

Hence, Father Saz concludes that the present embargo is too stringent and is not based on sufficient grounds. In the meantime the Spanish Government has appointed a commission to study the situation and to go about taking measures to remedy the evil.

P.H. Yancey S.J.

On the evening of Sunday, November 29, Father M.J. Ahern S.J., of St. Joseph's College, Philadelphia, Penn., lectured before the Ford Hall Open Forum, Boston, on "What a Scientist-Theologian Believes of Evolution". The Ford Hall Forum is the parent of the so-called "Open Forum", at least in the eastern United States. An "Open Forum Speakers Bureau" is maintained in Boston for the purpose of listing and engaging speakers for the various forums throughout the country. Last summer Father Ahern was asked to allow his name to be listed by the Bureau, and with the approval of Superiors he consented. The Ford Hall engagement was the first result of this listing. The lecture was given in the Ford Hall of Boston University School of Law, was attended by more than 1,200 people, and was broadcasted by WBZ and WBZA of Springfield and Boston respectively. Fifty minutes was allowed for the lecture, which was followed by a question and answer period of fifty minutes more. Questions and comments were telegraphed to the hall by radio listeners, a special line being laid to the hall for this purpose. The effect of the lecture, which was a simple statement of the position of Catholic theology and philosophy on the subject, can be estimated from the following extract from a letter of Mr. George W. Coleman, the Chairman of the Forum and generally considered the Father of the movement in this country:-

"We were all delighted with your address at the Ford Hall Forum last night. You won the good will of your audience completely and, I have no doubt, discounted a lot of prejudice and misunderstanding. To my mind it was one of the most wholesome and valuable meetings we have ever had in all our long history. The way in which you took your audience into your confidence and the spirit in which you met the questions made us all feel that you were in complete sympathy with our desire to get at the truth of things."

Since the lecture Father Ahern has received a large number of letters from radio listeners all over the East, some of whom heard the lecture from places further West than Dubuque, Iowa, and Chicago. Many inquiries were made by both Catholics non-Catholics for the names of books containing the Catholic view point, some of these inquiries coming from Catholic students at Dartmouth and Harvard. One letter was received from a Catholic lady in distant town in Ontario, Canada.

The lecture was given also at the Fortnightly Forum of the Catholic Alumni Sodality of Philadelphia, and is to be repeated at the Town Forums of Malden and Haverhill, Mass., on the afternoon and evening respectively of December 20.

PUBLICATIONS.

We have received a copy of the INTERNATIONAL SEISMOLOGICAL SUMMARY for 1921, January, February, March. This was formerly the BULLETIN OF THE BRITISH ASSOCIATION SEISMOLOGY COMMITTEE. It is edited by Prof. H.H. Turner, Professor of Astronomy and Director of the Observatory at Oxford. In his introduction Prof. Turner states that the present number opens the fourth year of the Summary in its International Form. In speaking of the cooperation he has received in the work, he says, "in the present number considerable volunteer help was given by Rev. Joseph Lynch S.J., of Fordham University, New York, which is here gratefully acknowledged."

TYCOS for Oct. 1925, gives a picture of Fr. J. O'Conor S.J. beside his seismograph at Fordham University and also a picture of the record of the earthquake of February 28, 1925.

The last number of the ZEITSCHRIFT FUR DEN PHYSIKALISCHEN UND CHEMISCHEN UNTERRICHT contains two articles by Father Th. Wulf S.J. of Valkenburg. The first is entitled "A New Universal Electroscope", and the second, "The Counting of alpha and beta Particles as a School Experiment".

Fr. F. Sohon S.J. of Valkenburg has an article entitled 'The Quaternion in Dyadic Dress" in the December number of the MATHEMATICAL BULLETIN of the Missouri Province.

Father F. Tondorf S.J. of Georgetown has an article in the MILITARY ENGINEER entitled "What We Have Learned from the Seismogram".

"A New Graphic Table of Logarithms". The MacMillan Company have recently published "A Graphic Table of Logarithms and Antilogarithms", by A. d'Ocagne and C.L. Ragot. The book has several interesting features which may appeal to our mathematicians and physicists. The familiar columns of mantissae are missing. Instead there are two columns at the left side of the page; the first contains the first two digits of the number, and the second the first two digits of the logarithm. The rest of the page has a double continuous scale. The lower scale gives directly the next three digits of the number and the upper scale the next three digits of the logarithm. One locates the number and directly above it are read off the last three digits of the logarithm. These are added to the two digits on the left. The great advantage of the system, which Father F. Gerst S.J. of St. Louis University points out in a brief quotation in Macmillan's add in SCIENCE, is the elimination of interpolation. Five place logarithms are read off directly. If desired one can obtain a sixth place by estimating tenths. Working backwards to obtain a number corresponding to a given logarithm is just as simple. The graphic table requires more pages than the old system. Thus in the latter all four place logarithms are given on two pages. The former requires six. By tabbing the pages and giving a little time to practise this may not be a serious difficulty.

NEWS.

On November 13 Father Tondorf S J. of Georgetown University read a paper on "Seismic Installations' at the weekly conference of the United States Coast and Geodetic Survey.

CHEMICAL REFERENCES.

"Mechanism of the Process of Dissociation inSolution". By C.J. Brockman, in Chem. and Industry, 1925, xliv, 501; also Chem. Abstr. 1925, xix, 2441. Evidence is presented against the generally accepted present day view that the solute not the solvent produces the ions. Evifence is accumulating in favor of the view that the reverse is the case.

"Starting a Small Chemistry Laboratory". By H.A Webb, in Journ. Chem. Educ., 1925, ii, 353. A very practical and useful description of the bare essentials for a simple chemical laboratory.

i. Furniture necessary.
ii. Apparatus necessary.
iii. Chemicals necessary.
iv. Books necessary.

"The Art of Lecture Table Demonstrating". By H.F. Davidson, in Jour Chem Educ., 1925, ii, 443-7. A short but highly practical paper, containing many hints, suggestions, etc., on the selection, preliminaries, operation, precautions, etc., etc.,of demonstration work in the chemical laboratory or class room.

"A Simple Method of Removing Frozen-in Stopcocks and Stopers". By E.G.R. Ardagh, in Can. Chem. and Met., 1925, ix, 137; also Jour. Chem. Educ., 1925, ii, 711. To remove a stopper broken flush with the neck : select an old stopper with a flat lower end about the same size as the exposed end of the stump to be extracted. Warm with the bunsen flame the exposed end of the stump and the lower end of the selected stopper and apply sealing wax to both. Force the two surfaces into contact at the same time using a twisting to-and-fro motion. When cool, hold the bottle in a horizontal position and rotate the neck slowly over a small flame until the glass is warm but not too hot to hold in the hand. Place the bottle upright on the table, encircle the neck with the fingers of the left hand, press firmly with the thumb against the top of the stopper with a lifting motion and with the square wooden handle of a spatula held by the blade, tap the opposite sideof the top at an angle of about 45 degrees. When a bottle contained alkali draw over the neck a piece of rubber tubing, pour in some diluted HCl, evacuate the tube, and allow the atmospheric pressure to force the air down between the surfaces.

George J. Whiple S.J.

THE BULLETIN WISHES ALL ITS READERS A VERY JOYOUS

CHRISTMAS SEASON AND EVERY BLESSING DURING

THE COMING YEAR OF

1926.

McCullough